



National Aeronautics and
Space Administration
Goddard Space Flight Center

DIRECTIVE NO. GMI 1710.6B
EFFECTIVE DATE April 22, 96
EXPIRATION DATE _____

DIRECTIVE INFORMATION SHEET

TITLE: CERTIFICATION AND RECERTIFICATION OF LIFTING DEVICES AND
EQUIPMENT, AND CRITICAL LIFT REQUIREMENTS

1. PURPOSE

This revision is needed to: a) Bring the Center's Recertification Program (RECERT) more in line with requirements of the NASA Safety Standard for Lifting Devices and Equipment (NSS/GO-1740.9B); b) Reflect the Center Institutional Planning Committee (IPC)-approved Program changes; and c) Establish and clarify Center requirements associated with critical lift operations, i.e., Lift Stability Analysis and Safety Analysis, respectively.

2. REVISION

Revision B.

3. CANCELLATION

This revision cancels GMI 1710.6A dated September 21, 1993.

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MANAGEMENT INSTRUCTION

TITLE: CERTIFICATION AND RECERTIFICATION OF LIFTING DEVICES AND EQUIPMENT, AND CRITICAL LIFT REQUIREMENTS

1. PURPOSE

This GMI establishes the policy and requirements for the Goddard Recertification Program (RECERT) to provide Center organizations with consultation, inspection, and certification/recertification of lifting devices and equipment (LDE) and LDE operator training and certification. This Center funded Program improves safety, and minimizes potential damage and/or loss of hardware and facilities associated with lifting operations. In addition, this Instruction addresses requirements associated with critical lifting operations to prevent potential damage/loss to critical hardware and technical facilities. The policy and requirements established herein meet those mandated by the "NASA Safety Standard for Lifting Devices and Equipment" (NSS/GO-1740.9) and "NASA Safety Policy and Requirements Document" (NHB 1700.1(V1-B)).

2. APPLICABILITY AND EXCLUSIONS

- a. This GMI is not a substitute for applicable OSHA requirements. OSHA requirements apply to all GSFC lifting operations.
- b. This GMI is applicable to critical and noncritical lift operations (reference Glossary, items d and r).
- c. This Instruction stipulates the RECERT requirements for LDE used on GSFC properties at Greenbelt, Wallops Island, and other areas under GSFC cognizance (for off-site Contractor installations, see item 2.d.), regardless of user or owner, unless specifically excluded by this Instruction or by the RECERT Manager.
- d. The need for compliance with this Instruction at off-site contractor installations supporting GSFC flight project work should be evaluated and made a contractual requirement where deemed necessary by the Contracting Officer and the Flight

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Project Manager with assistance from the Goddard Contracting Safety Representative and the RECERT Manager, as required. (

- e. Contractor LDE used for critical lifts on GSFC property shall be in compliance with this Instruction. Contractor LDE used for facilities repair, maintenance, modification, and construction projects or other activities involving noncritical lifting operations are excluded from this Instruction.
- f. Tenants and their contract personnel operating in facilities exclusively used for non-GSFC operations and controlled by the tenant under a Center-level Memorandum of Understanding or equivalent document are excluded from this Instruction.
- g. The Division Office or Flight Project Office responsible for oversight of any commercial flight projects shall ensure that LDE brought onto GSFC property in support of such projects be contractually obligated to comply with the requirements of this Instruction.

3. POLICY

- a. Lifting devices and equipment which are included in the RECERT Program (as listed in Table 1), shall be formally certified and recertified by the RECERT Manager. LDE are certified before first use and recertified periodically after initial certification. (
- b. Institutional Material Handling Equipment (IMHE) not listed in Table 1 are not subjected to RECERT. However, IMHE may be inspected, certified and recertified by RECERT at owner's funding and written request designating the equipment as critical.
- c. GSFC Flight Project related LDE and flight hardware handling equipment to be used for launch support shall also conform to host launch site certification tagging requirements.
- d. Copies of test and inspection reports for off-site operations, including Contractor installations if applicable, shall be forwarded to the RECERT Manager for annual recertification and recordkeeping.
- e. A Failure Modes and Effects Analysis (FMEA) shall be performed for lifting devices used for critical lifts. Lifting device FMEA's shall be reviewed and approved by the RECERT Manager.
- f. LDE operators shall be trained and certified in accordance with NSS/GO-1740.9 and RECERT requirements. Operator certification requires physical examination, classroom and hands-on training, and annual refresher classes. (

- g. Altered critical lift assemblies shall be proof load tested, and certified as a system unless specifically exempted by a temporary waiver/deviation request reviewed and endorsed by the Flight Project Manager and approved by the RECERT Manager. Alteration is defined as extension, modification, addition, deletion, or replacement of components to the original lift assembly. All components comprising a critical lifting assembly shall be uniquely identified, and configuration controlled for that assembly only, and shall not be interchanged for use elsewhere. Replacement of identical and individually proof tested components is permissible without having to reproof entire assembly.
- h. A Safety Analysis and a Lift Stability Analysis shall be performed and documented by the Flight Project representative who is responsible for the critical lift prior to lift operations. These analyses shall be approved by the Project Safety Manager (PSM) or representative of the Wallops Safety and Quality Assurance Engineering Branch, and the Facilities Operations Manager (FOM) or their designees.
- i. Waivers/deviations from the requirements of this Instruction shall be prepared and approved as outlined in NHB 1700.1 and Section 8 of this Instruction prior to lift.

4. REQUIREMENTS

- a. LDE shall be designed, fabricated, and certified in accordance with applicable codes, standards, and RECERT procedures (see Section 5). Where possible, new lifting devices should be Original Equipment Manufacturer's (OEM) standard design, commercially available units. Specially designed, one-of-a-kind lifting devices should be avoided due to their unproven reliability.
- b. The Flight Project Office or Division Office or their designees shall document the category of lifts, i.e., critical or noncritical, so that compliance requirements for lifting operations can be established accordingly.
- c. Critical lift requirements include:
 - (1) Critical lifting device and equipment shall be certified. Lifting device shall be equipped with two means of braking, each shall be capable of bringing a rated load to zero speed and holding it (with and without power), and dual upper limit switches (except manual hoists). Also, a lifting device FMEA shall be performed and documented;
 - (2) operators certified for critical lifts;
 - (3) Safety Analysis;
 - (4) Lift Stability Analysis; and

- (5) special lift procedures (technical operating procedures).

5. APPLICABLE CODES, STANDARDS, AND GUIDES IN ADDITION TO REFERENCES PROVIDED IN NSS/GO 1740.9, PARAGRAPH 105 (CURRENT EDITIONS)

- a. Department of Labor: Occupational Safety and Health Administration (OSHA); Occupational Safety and Health Standards.

- (1) 1926.550, "Cranes and Derricks"
- (2) 1926.251, "Rigger Equipment and Material Handling"

- b. American National Standards Institute (ANSI)

- (1) ANSI B30.4, Portal, Tower, and Pillar Cranes.
- (2) ANSI/ASME B30.21, Manual Lever Operated Hoists.
- (3) ANSI/ASME B30.22, Articulating Boom Cranes.
- (4) ASME/PADL-12, Shop Cranes.
- (5) ANSI/ASME NOG-1, Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)
- (6) ANSI/ASME B30.20, Below the Hook Lifting Devices.

- c. National Aeronautics and Space Administration (NASA)

NSTS 22206, "Requirements for Preparation and Approval of Failure Modes and Effects Analysis (FMEA) and Critical Items List (CIL)."

NASA Goddard Management Instruction (GMI) 1700.3A, "Systems Safety for Orbital Flight Projects."

NASA Headquarters/Director, Safety and Risk Management Division instruction to SR&QA Directors, Safety Directors, Operational Safety Managers, Subject: Personnel Lift with a Crane, dated June 2, 1995.

- d. MIL-C-28546, Cranes, Overhead Traveling, Underhung, Electric Powered.
- e. Referenced material for Power Crane and Shovel Association (PCSA) Standards No. 4 and No. 5.

6. RERATING

Owner organization may request RECERT to rerate their lifting device. Rerating of lifting device and subsequent recertification shall be accomplished as follows:

- a. Engineering analyses shall be performed in accordance with CMAA and OSHA requirements to validate that the lifting device can be used at the new rerated load. Building structural support system(s) shall also be validated in terms of the new rerated load. Rerating resulting in higher equipment rated capacity may require OEM approval prior to modification.
- b. Certify lifting device and retag/mark with rerated capacity.

7. TRANSFER OF LDE

- a. RECERT documentation will accompany LDE permanently transferred from GSFC to other locations or users.
- b. LDE and associated documentation transferred to GSFC shall be reviewed for recertification by RECERT.

8. WAIVERS AND DEVIATIONS

A waiver/deviation request package shall be prepared by the Flight Project/Division Office or their designees in accordance with NHB 1700.1(V1) and RECERT procedures if a mandatory requirement of NSS/GO-1740.9 and/or a current GSFC RECERT policy cannot be met. OSHA requirements may not be circumvented by a GSFC waiver/deviation. The waiver/deviation request package shall be reviewed and endorsed by the initiating Flight Project/Division Office and forwarded to the RECERT Manager or his/her designee for review, approval/disapproval, and other actions as appropriate.

- a. Waivers/deviations approved at GSFC will be forwarded to NASA Headquarters by RECERT semi-annually for incorporation into the NASA Safety Information System (NSIS).
- b. LDE waiver/deviation requests at off-site Contractor installations shall be reviewed and endorsed by the Contracting Officer, Flight Project Manager, Goddard Contracting Safety Representative, and forwarded to the RECERT Manager for review, approval/disapproval, and other actions as appropriate.

9. TAGGING

Tagging of all LDE shall be as authorized by the RECERT Manager. The following methodology shall be used for LDE tagging:

- a. Red tag: "DANGER - Do Not Operate," lock out and remove from service due to a safety problem that may result in death, injury, or property damage;
- b. Yellow tag: "CAUTION," the LDE is operational; however, there is potential local hazard(s) which can be neutralized by implementing proper precautions by the operator; and

- c. Brass or other authorized tags: "CERTIFIED/RECERTIFIED," LDE has been successfully tested and inspected for use at the original or rerated load. Each tag will indicate the rated load, certification expiration date, LDE identification number, LDE Category, i.e., critical or noncritical; and initials of the RECERT Inspector who performed the inspection.

10. ADDITIONAL RESPONSIBILITIES

a. Office of the Engineering Directorate, Code 700

- (1) Recommends a candidate RECERT Manager to the Office of the Director for approval.

b. Office of the Suborbital Projects and Operations Directorate, Code 800

Appoints the Deputy RECERT Manager for WFF with concurrence from the RECERT Manager.

c. RECERT Manager is responsible for the LDE Recertification Program with assistance from two Deputy RECERT Managers. The RECERT Manager:

- (1) provides technical directions to the Deputy RECERT Managers and the RECERT Support Function;
- (2) appoints the Deputy RECERT Manager for Greenbelt;
- (3) certifies and recertifies LDE;
- (4) meets with NASA Headquarters and other NASA Centers on Agency policy pertaining to LDE;
- (5) prepares annual RECERT budget and requests the required Center funding to implement the Program;
- (6) coordinates with affected Center safety offices on issues of mutual interests;
- (7) previews, approves, and monitors the training courses for certifying riggers and lifting devices and equipment operators;
- (8) certifies LDE operators and riggers for critical and noncritical lift operations;
- (9) approves temporary (45 days or less) waiver/deviation request in accordance with Center authority delegated via this GMI in compliance with NHB 1700.1 (V1), "NASA Safety Policy and Requirements Document," paragraph 121.e.(2);

- (10) reviews permanent waiver/deviation request (in excess of 45 days) and forwards requests to NASA Headquarters, Office of Safety and Mission Assurance for approval, if appropriate;
- (11) provides copy of approved waivers/deviations to the Safety, Environmental and Security Office for record;
- (12) provides consultation for lifting device design, specification, and modification;
- (13) approves the rerating of lifting devices;
- (14) ensures that a RECERT configuration control and management (CCM) system for lifting devices is maintained;
- (15) provides the responsible Division a list of lifting device deficiencies, as required, following an inspection; and
- (16) provides Division Offices with an inventory of Division lifting devices for review and update as required.

d. Deputy RECERT Managers

The Wallops Deputy RECERT Manager represents the RECERT Manager at the Wallops Flight Facility for day-to-day operations. The Greenbelt Deputy RECERT Manager assists the RECERT Manager in managing and implementing the Program, and represents the RECERT Manager during his/her absence.

e. Flight Project Offices:

- (1) provide resources for training and insure that LDE operators and riggers are certified;
- (2) maintain an inventory, ensure documented compliance of this Instruction, for Project slings, shackles, turnbuckles, D-rings, and any other lifting equipment; and
- (3) notify the RECERT Manager and owner Division Office immediately of all LDE deficiencies and failures.

f. Safety, Environmental and Security Office:

- (1) reviews RECERT operations for compliance with OSHA and NSS/GO-1740.9;
- (2) monitors the Institutional safety requirements of this GMI; and

- (3) establishes LDE operator physical examination criteria for critical and noncritical lift operations, using applicable NASA and ANSI requirements;

g. Division Offices:

- (1) insure that LDE are certified prior to use;
- (2) provide resources for training and insure that LDE operators and riggers are certified;
- (3) determine the appropriate Category (critical or noncritical) of each LDE in the Division, and provides the Category information to RECERT as required;
- (4) assist RECERT to determine the appropriate lifting device Usage Category, i.e., Active, Standby, or Idle, based on current and projected operational requirements;
- (5) maintain an inventory and assure documented compliance of applicable codes and standards for Division slings, shackles, turnbuckles, D-rings, and any other lifting equipment;
- (6) alert RECERT to perform certification on new or transferred LDE prior to their use;
- (7) perform spot compliance checks to verify daily inspections are being accomplished;
- (8) notify the RECERT Manager immediately of all LDE deficiencies and failures;
- (9) initiate repair for LDE deficiencies surfaced during test and inspections;
- (10) provide inputs to the Center Facilities Rehab and Mod or Construction of Facilities budgets to bring their lifting devices into compliance with this GMI; and
- (11) review Division LDE inventory as requested by the RECERT Manager;

h. Facility Operations Managers or Branch Heads are responsible for day-to-day operations of LDE under their cognizance and:

- (1) coordinate load testing and inspections of inventoried lifting devices with RECERT to minimize conflicts with ongoing operations; and
- (2) notify RECERT of any deficient LDE that is removed from service;

i. Certified LDE Operators:

- (1) ensure certification status of LDE is current before commencing lifting operations;
- (2) perform LDE inspections and tests in accordance with RECERT procedures;
- (3) provide entry in the lifting device (including Hydra-set) log book for all inspections, tests, and operations; and
- (4) perform LDE lock out procedures and notify RECERT of deficiencies observed.

11. INTERPRETATION, CHANGES, AND REVISIONS

Questions on interpretations and recommendations for changes or revisions to this GMI are welcomed and should be forwarded in writing to the RECERT Manager/Code 750.

12. AVAILABILITY

Copies of this GMI may be obtained from Code 239, Store Stock Supply, Building 16.



Joseph H. Rothenberg
Director

TABLE 1

LDE REQUIRED TO BE CERTIFIED/RECERTIFIED PER NSS/GO-1740.9B

<u>ITEM</u>	<u>LIFTING DEVICES AND EQUIPMENT</u>
1.	Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist, and Jib Cranes)
2.	Mobile Cranes
3.	Base Mounted Drum Hoists
4.	Monorails and Underhung Cranes and Hoists
5.	Manually Operated Lever Hoists
6.	Special Hoist Supported Personnel Lifting Devices
7.	Hydra-sets
8.	Hooks
9.	Wire Rope Slings
10.	Alloy Steel Chain Slings
11.	Metal Mesh Slings
12.	Natural or Synthetic Slings
13.	Structural Slings
14.	Lifting assemblies
15.	Shackles, Turnbuckles, Eye Bolts, Swivel Joints, Connecting Links, etc.

NOTE:

Institutional Material Handling Equipment (IMHE) are not subjected to RECERT. However, IMHE may be inspected, certified, and recertified by RECERT if specifically requested in writing and funded by the owning Division Office designating those equipment as "Critical." IMHE includes Winches, Forklifts, Ground Supported Personnel Lifts, Aerial Buckets, Scissors Lifts, Vehicle Mounted Work Platforms, High Rangers, Hydraulic Lift Tailgate, etc.

GLOSSARY

The following definitions apply to this Instruction:

- a. Acceptable Risk - An LDE or lifting operation related hazard whose residual risk is not completely mitigated and that has been accepted by the Flight Project Manager or Division Chief and the RECERT Manager.
- b. Commercial Flight Project - Any non-U.S. Government organization or project not normally subject to GSFC requirements which conducts business or operations on a GSFC facility under a contract, Memorandum of Understanding, or equivalent document.
- c. Criticality - A term that characterizes both the lift operation and LDE. There are two categories of lifting operations/LDE: critical and noncritical.
- d. Critical Lifts - Lifting operations with special, high dollar items such as spacecraft, one-of-a-kind articles, or major facility components, whose loss would have serious programmatic impact. Operations involving lifting of personnel with a crane shall be deemed a critical lift.
- e. "Designated Critical" Institutional Material Handling Equipment - any institutional support, non-flight project related materials handling equipment that are not listed in Table 1, which are either excluded, or not defined as a lifting device per NSS/GO-1740.9. However, due to the important role that some of these equipment may serve in their respective organizations, their owning organization may elect to designate certain pieces as critical and may request RECERT to certify and recertify them.
- f. Deviation - A variance that authorizes departure from a particular safety requirement, where the intent of the requirement is being met through alternate means that provide an equal or greater level of safety.
- g. Failure Mode and Effects Analysis (FMEA) - A systematic, methodical analysis performed to highlight and document all identifiable failure modes and single point(s) of failure at a prescribed level and to specify the resultant effect of the modes of failure. The FMEA shall be performed in accordance with NSTS 22206, "Requirements for Preparation and Approval of Failure Modes and Effects Analysis (FMEA) and Critical Items List (CIL)."
- h. Host Launch Site - Any launch site supporting GSFC or GSFC managed flight projects.
- i. LDE Engineer/Manager - This title is obsolete and replaced by "RECERT Manager."

j. LDE Inspections -

Operator Inspection and Limit Switch Test are performed by the operator in accordance with RECERT procedure.

(1) Active Lifting Devices:

- (a) RECERT Frequent Inspections are performed at monthly intervals.
- (b) RECERT Periodic Inspections for recertification are performed once a year. For critical cranes, a Rated Load Test is included as part of the annual Periodic Inspection. For noncritical cranes, the Rated Load Test is included as part of the Periodic Inspection every fourth year.

(2) Standby Lifting Devices:

- (a) RECERT Frequent Inspections are performed at 5-month intervals.
- (b) RECERT Periodic Inspections are performed once a year. For critical cranes, a Rated Load Test is included as part of the annual Periodic Inspection. For noncritical cranes, the Rated Load Test is included as part of the Periodic Inspection every fourth year.

(3) Idle Lifting Devices:

- (a) Lifting Devices are tagged and locked out-of-service.
- (b) Tests and inspections are not required during an idle period.
- (c) Lifting Devices shall be recertified by RECERT prior to returning to service.

(4) Lifting Equipment:

Rated load tests for recertification for critical lifting equipment are performed annually (Hydra-sets every 2 years); for noncritical lifting equipment, every 4 years.

k. LDE Operator Certification - The documented status of LDE operators validating that they are trained and qualified in accordance with NSS/GO-1740.9 and certified by the RECERT Manager.

l. LDE Certification/Recertification - A process performed by RECERT which leads to the initial, or continuation of, certification that an LDE is safe to use up to its rated load. The process includes, but is not limited to, LDE compliance and documentation reviews, tests, inspections, nondestructive testing, and analyses.

- m. Lifting Assembly - is a lifting system comprised of a combination of any of the following: slings, strongbacks, shackles, turn buckles, D-rings, lift frames, etc., used to attach the load to the lifting hook.
- n. Lifting Devices and Equipment (LDE) (see Table 1) - Lifting devices are machines such as cranes, hoists, gantries, etc., used for lifting, lowering, and moving loads horizontally. Lifting equipment includes Hydra-sets, load cells, slings, strong backs, shackles, and lifting assemblies used to attach the load to the lifting hook.
- o. Lifting Devices Usage Category -
 - (1) Active - Lifting Device is used daily or at least several times a week.
 - (2) Standby - Lifting Device is used no more than once a week.
 - (3) Idle - There is no planned use of the lifting device for the next 12 months.
- p. Lift Stability Analysis - A documented assessment or analysis to ensure that the lift will be stable and the risks of tipping the load are eliminated during critical lift operations.
- q. Manufacturer/Fabricator Documents - Documents that are used during the certification/recertification of LDE that include drawings, materials identification, load capacities, and other pertinent data.
- r. Noncritical Lifts - General lifts that typically involve routine and minimal hazard lifting operations whose loss would not impact critical facility operations or critical programs.
- s. Nondestructive Testing (NDT) - The development and application of technical methods to examine materials or components in ways that do not impair future usefulness and serviceability in order to detect, locate, measure and evaluate discontinuities, defects and other imperfections; to assess integrity, properties and composition; and to measure geometrical characteristics.
- t. RECERT Documentation - Files that are maintained for LDE that may include, but are not limited to, manufactures's/fabricator's documents, field test data, FMEA, results of analyses, repair history, facility descriptions, record of all waivers, rerating, and correspondence.
- u. RECERT LDE Inspectors - RECERT Support Function inspectors who conduct tests and inspections including nondestructive testing (NDT) for certification of LDE.
- v. RECERT Support Function - On-site support services contractor providing engineering, technical, and administrative support to implement the Center's RECERT Program under the technical direction of the RECERT Manager.

- w. Recertification Program (RECERT) Manager - The RECERT Manager, appointed by the Center Director, who has overall implementation, managerial, certification, and recertification responsibilities for the Center's RECERT Program for LDE and Pressure Vessels and Pressurized Systems (PV/S). (Note: PV/S RECERT requirements are covered in GMI 1710.4.)
- x. Rerating - A term that describes the RECERT process by which an LDE rated load is altered from the original manufacturer's rated load.
- y. Safety Analysis - A documented assessment or analysis that examines hardware-facility-environment-human relationship that could cause loss of life, personal injury, or property damage and recommended solutions for those conditions. When fittings on flight hardware are used for ground handling, an analysis shall be included to ensure that components in the load path have adequate safety factors.
- z. Sling - A single unit or a lifting assembly and associated hardware used to attach the load to the lifting hook.
- aa. Waiver - An authorized departure from a particular safety requirement contained in NSS/GO-1740.9 where an increased level of risk has been accepted.

